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1. SCOPE

The purpose of this document is to specify the functional requirements of a convection cooled 60W continuous output with dual AC input (110/220 VAC with auto select). The PSU contains three DC outputs in an open frame, PCB mount design.

Models covered : MVLT60-3200, MVLT60-3201, MVLT60-3202, MVLT60-3203

2. CONNECTIONS

The following will specify the input and output connections provided by the power supply.

2.1 INPUT CONNECTOR
Molex 3 position, 0.156 center header
J1-1 (N), J1-2 (L)

2.2 OUTPUT CONNECTORS
Molex 6 position, 0.156 center header

2.3 OUTPUT PIN ASSIGNMENTS INCLUDING

MVLT 60-32XX	Pin-outs
V1+	Pins 1-2
COM	Pins 3-4
V2+	Pin 6
V3-	Pin 5

3. ELECTRICAL REQUIREMENTS

(Unless specified otherwise, all specifications are at nominal input voltage, full load, and 25°C, with PSU in warmed up condition. Unless specified, all specifications will be within 3% of the stated typical value.)

This section defines the electrical requirements for the power supply unit.

3.1	INPUT The operating conditions for the AC input are described in this section.
3.1.1	INPUT VOLTAGE The operating range is 90 – 132 VAC / 180 - 264VAC, single phase.
3.1.2	INPUT CURRENT With an input voltage of 90VAC, at 60W output, the RMS input current shall be less than 1.6A.
3.1.3	INPUT FREQUENCY Input frequency range 47 – 63 Hz.
3.1.4	INRUSH CURRENT Maximum inrush shall be 75A at 264VAC at cold start.
3.1.5	EFFICIENCY The efficiency of the power supply is 85% typical. Measured at V1 @ 30W and V2 @ 30W, V3@0W nominal AC input voltage (230VAC). Measurement is taken at the PCB connector pads at 25°C ambient after a 5 minute warm up cycle.
3.2	OUTPUT The operating conditions for the DC output are described in this section.
3.2.1	OUTPUT POWER The power supply will provide up to three DC outputs. The maximum total continuous output power is 60W with free air convection.

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3.2.2 OUTPUT VOLTAGE

Initial setting tolerance is measured with 50% of load range on all outputs, with line voltage set at nominal. The voltage and initial setting tolerance of each output will be provided as follows.

Model	O/P					
	NOM. V1	SET TOL.	NOM. V2	SET TOL.	NOM. V3	SET TOL.
MVLT 60-3200	+5.2V	±3 %	+12.5V	±5 %	-12.80V	±5 %
MVLT 60-3201	+5.2V	±3 %	+24.0V	±5 %	-12.80V	±5 %
MVLT 60-3202	+5.2V	±3 %	+14.6V	±5 %	-14.8V	±5 %
MVLT 60-3203	+3.3V	±3 %	+5.1V	±5 %	-12.80V	±5 %

3.2.3 OUTPUT CURRENT

3.2.3.1 RATED OUTPUT CURRENT

The total output power is 60W maximum with free air convection. Maximum continuous currents rating of the individual outputs are listed in the following table.

Model	V1		V2		V3	
	Min.	Max.	Min.	Max.	Min.	Max.
MVLT 60-3200	0.5A	8A	0.1A	3.0A	0A	0.5A
MVLT 60-3201	0.5A	8A	0.1A	1.5A	0A	0.5A
MVLT 60-3202	0.5A	8A	0.1A	2.5A	0A	0.5A
MVLT 60-3203	1.0A	8A	0.1A	3.0A	0A	0.5A

3.2.4 OUTPUT REGULATION

3.2.4.1 LINE REGULATION

Measured by varying the line voltage from 111±21VAC / 220±42 VAC, at full load.

OUTPUT	TOLERANCE
V1	0.3%
V2	0.3%
V3	0.3%

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3.2.4.2 LOAD REGULATION

Measured by varying the load current from minimum to 50% to maximum load at nominal AC input voltage with all other outputs set to 20% of full load. This is measured at the output connector after 500mS settling time, and expressed as percentage of set point voltage. The Maximum value (worst case) is shown below.

	Load Regulation of Outputs		
Model	**V1**	**V2**	**V3**
MVLT60-3200	±0.5 %	±5 %	±5 %
MVLT60-3201	±0.5 %	±5 %	±5 %
MVLT60-3202	±0.5 %	±5 %	±5 %
MVLT60-3203	±0.5 %	±5 %	±5 %

3.2.4.3 CROSS REGULATION

Keeping the output under observation at 50% load, while varying all other output loads by 50% of their respective load range, the said output will meet the load regulation limit of section 3.2.4.2. The total output power should never exceed the rated maximum power. Voltage is measured at the output connector after a 500mS settling time.

3.2.5 OUTPUT RIPPLE AND NOISE VOLTAGE (PARD)

The maximum allowable pk-pk PARD ripple and noise, measured at maximum load on the specific output while keeping total maximum o/p power to 60W is shown in the following table. It is measured after a 5 minute warm up with 0.1 C-Cap and 10uf E-Cap/Tant Cap. Connected at the measurement point.

Model	% of Vout @ NOMINAL		
	V1	V2	V3
MVLT60-3200	1%	1%	1%
MVLT60-3201	1%	1%	1%
MVLT60-3202	1%	1%	1%
MVLT60-3203	50mV	1%	1%

3.2.6 OUTPUT TRANSIENT RESPONSE

The load current of measured output is changed from 50% of load range to 100%, at 0.1A/uSec slew rate, 50% duty cycle, 50/60Hz. The recovery time and maximum excursion is measured with reference to the point when the output voltage is within 1% of the load regulation band. It is measured after a 5 minute warm up with 0.1 C-Cap and 47uf E-Cap connected at the measurement point to reflect an actual load setup. All other outputs are kept at 50% load.

OUTPUT	**RECOVERY TIME**	**MAXIMUM EXCURSION**
V1	≤5mS	<10%
V2	≤5mS	<5%
V3	≤1mS	<1%

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						3.2.7	OUTPUT VOLTAGE DRIFT Long-term output voltage drift over 1000 hours operation for V1 is less than 0.5%.
						3.2.8	OUTPUT OVERSHOOT The overshoot voltage is measured as a percentage of the nominal output voltage when PSU is initially powered up. Measured with V1 @ 6A.

OUTPUT	OVERSHOOT
V1	<10%

						3.2.9	OUTPUT PROTECTION The power supply is provided with protection against any fault condition described below and will self-recover with a maximum restart time of 6 seconds after the fault condition has been removed.
						3.2.9.1	OVERVOLTAGE (V1 ONLY) Output folds back at 6.2V ±0.4VDC for 5V; 3.95V ±0.25V for 3.3V).
						3.2.9.2	OVERLOAD PROTECTION Typically occurs @ 80W. O/P shuts down and hiccups. The PSU will recover when overload condition is removed.
						3.2.9.3	OUTPUT SHORT CIRCUIT The power supply is protected against output short circuit. Average short circuit shall be less than 50% of rated load current under all conditions. Output voltage of less than 0.5V constitutes a short.
						3.2.10	RISE TIME The output rise time measured from 10% to 90% is :

OUTPUT	RISE TIME
V1	<100mS
V2	<100mS
V3	<100mS

						3.2.11	TURN-ON DELAY The turn-on delay time of the main output after AC power is applied from a cold condition is 4.0 seconds MAXIMUM at 115 VAC.
						3.2.12	OUTPUT HOLD-UP TIME The power supply shall maintain all outputs with their voltage/current specifications after any loss of input power for a minimum of 6mS, measured at nominal AC input voltage (115VAC). Measured at V1 regulation band crossing.
						3.2.13	TEMPERATURE COEFFICIENT Measured on V1 only, temperature coefficient over entire operating temperature range of 0°C to 50°C after one-hour warm-up is:

OUTPUT	COEFFICIENT
V1	≤2.4mV/°C

4. ENVIRONMENTAL REQUIREMENTS

						4.1	TEMPERATURE Operating temperature range: 0°C to 50°C at the full rated output power. Non-operating temperature range: -40°C to +70°C.
						4.2	ALTITUDE Maximum operating altitude: 10,000 feet. Maximum non-operating altitude: 40,000 feet.
						4.3	HUMIDITY Non-condensing relative humidity range: 5% to 95%.

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						4.4	SHOCK AND VIBRATION Operating Shock: Three shocks, 15G peak, 11mS sinusoidal, ±1 mS. Both directions of perpendicular axis. Non-Operating Shock: Three shocks, 50G peak, 11mS sinusoidal, ±1 mS. Both directions of perpendicular axis. Operating and Non-Operating Vibration: 5-9Hz, 0.5" double amplitude, 2G PK, 0.5 oct./min, 2 cycles; 9-500Hz, 4G pk-pk, 0.5 oct./min, 2 cycles.
						4.5	EMI TRANSIENT SUSCEPTIBILITY The unit shall comply with the requirements of IEC 1000-4-2, IEC 1000-4-4 and IEC 1000-4-5.
						4.6	N/A

5. SAFETY REQUIREMENTS

						5.1	DIELECTRIC WITHSTAND VOLTAGE Minimum dielectric withstand voltage between Input to output = 5700 VDC / 1 minute.
						5.2	INSULATION RESISTANCE Minimum insulation resistance: Input to output - 7 Meg. ohm.
						5.3	LEAKAGE CURRENT Leakage current per IEC 601 shall be 250uA maximum.
						5.4	SAFETY SPACINGS The PCB spacing will comply with the safety standards per 5.5.
						5.5	SAFETY STANDARDS The power supply will meet Class 1, SELV of the following safety agency requirements: IEC601, EN60601 with the following deviations: VDE UL 2601 (Recognized Component) C-UL (Canadian Approval by UL)
						5.6	RELIABILITY
						5.6.1	MTBF (Mean time between failure): MTBF @ 25°C is more than 200,000 hours. Calculated as per MIL-H 217F.

6. EMI REQUIREMENTS

The power supply shall comply to the limits CISPR 11 and CISPR 14 Class B (at 230 VAC and 115 VAC). FCC 47 CFR Part 15, Class B (115 VAC)

7. APPLICABLE DOCUMENTS

Audit Test Program
Production 1 Test Program
Production 2 Test Program
QC Test Program

8. MECHANICAL

8.1 WEIGHT
8.1.1 Complete PSU: Total weight = 10 oz.
8.2 DIMENSIONS
8.2.1 Outline Dimension: External dimensions of the PSU.

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